IT R&D Global Leader
ETRI

Digital Home

# WiMedia UWB 기술개발 및 응용사례


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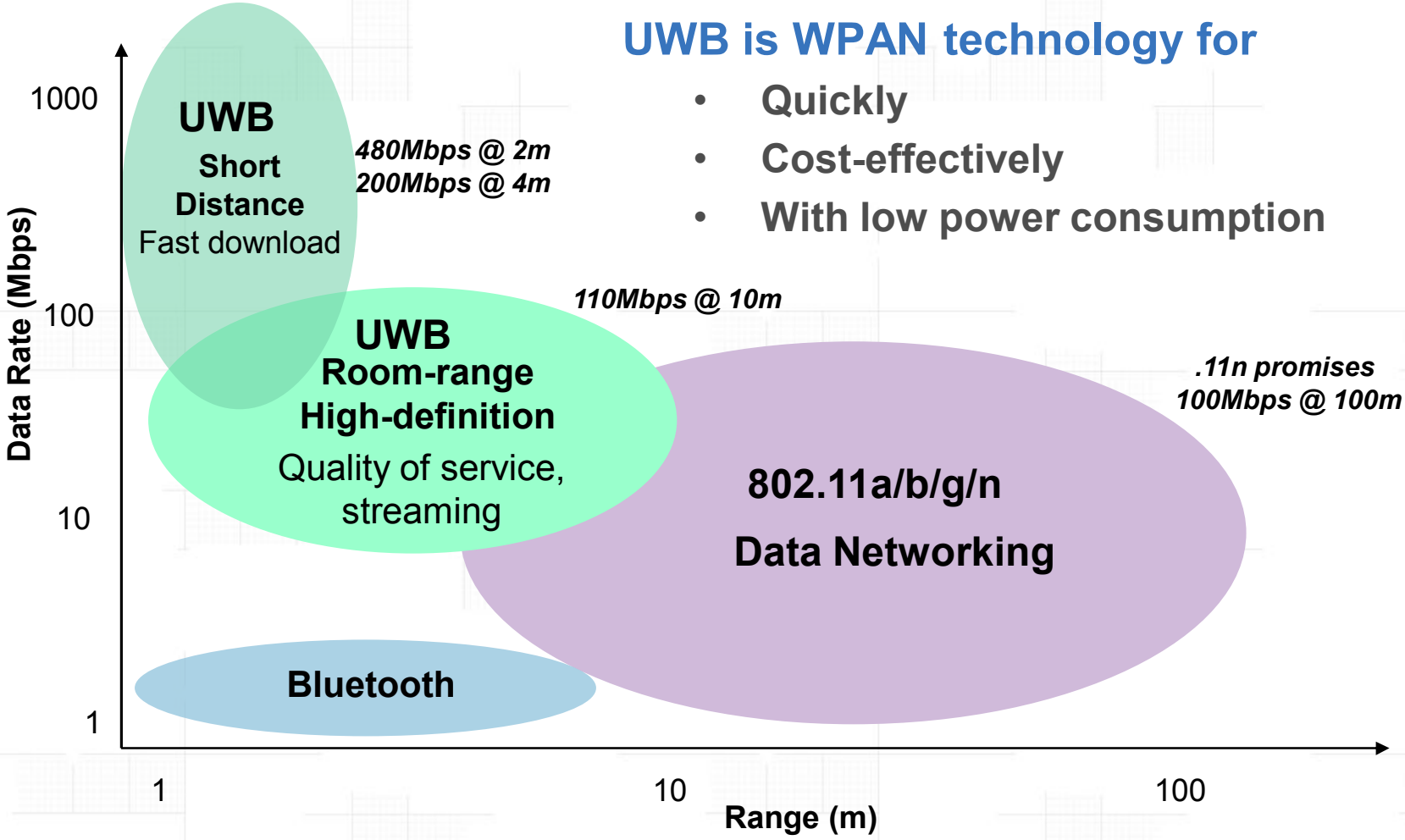
# Agenda

1. WiMedia UWB Overview
2. WiMedia Status & Roadmap
3. WiMedia UWB Applications
   - Wireless USB
   - WLP
   - DLNA
   - Bluetooth
4. WiMedia UWB Enabling Products
5. Conclusions

# What is the WiMedia Alliance?

# UWB Qualities




Source: Texas Instruments

# WPAN Comparison

| Attribute | WiMedia UWB | WiFi | 60 GHz |
|---|---|---|---|
| Range | 1-10m | 1-70m<br>▪ Range too long for WPAN - pro ducts will interfere with each other across the building | <1m to 10m<br>▪ Low cost products < 1m<br>▪ Complex implementations with multiple trainable antennas >3m |
| Maturity | Mature - Products on market | Very mature - Millions of products on Market | Immature - No products on market |
| PAN density | High | Low | High |
| Power Consumption | Low | Medium | High |
| Cost | Low | Low | High |
| Bandwidth | 480 to 1000 Mbps | 54 to 600 Mbps | 400 to 6000 Mbps |
| Suitability for Wireless USB | Yes - already standardized | No - IP protocol not suitable for USB devices | No- too expensive, high power, no protocol defined |
| Suitability for PC Docking | Yes<br>▪ True PAN<br>▪ High BW<br>▪ Low Cost | No<br>▪ Too little BW<br>▪ Signal propagates across building, low user density | TBD<br>▪ Complex radio and antennas<br>▪ High Cost<br>▪ High Power Consumption |
| Suitability for Wireless HDMI | Yes<br>▪ High BW<br>▪ Low Cost | TBD<br>▪ BW adequate with high video compression<br>▪ Subject to limited density | Possible<br>▪ A/V products can tolerate high power and high cost<br>▪ No compression required |

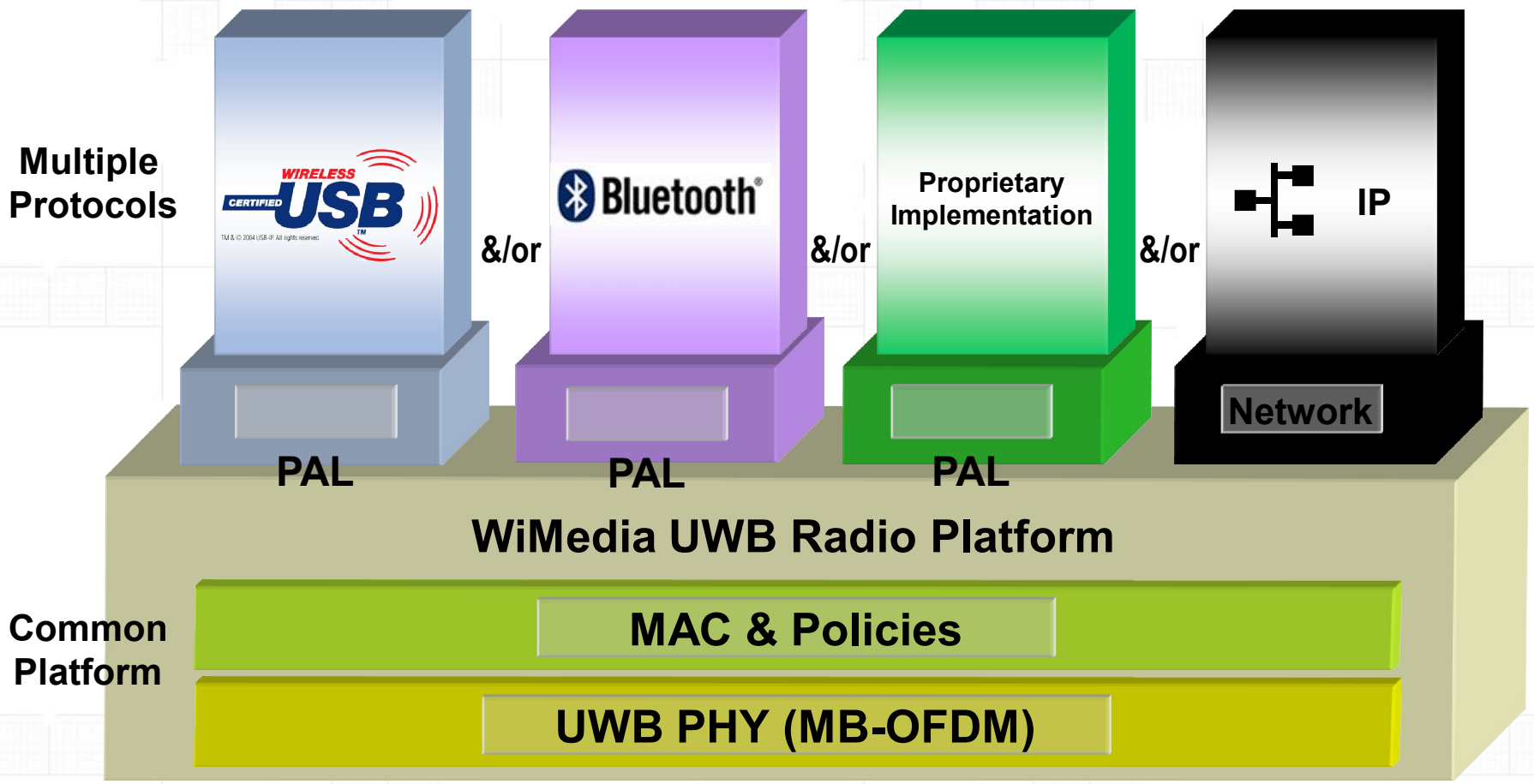
# UWB Trend

- 802.15.3a stopped in January 2006
  - Progress had become impossible
  - Project Authorization Request (PAR) expired
- WiMedia took MB-OFDM PHY, WiMedia MAC, MAC-PHY interface to ECMA
  - Ratified as ECMA-368/369
  - On a track to ISO/IEC 26907/26908
- Ecosystem
  - At least 20 companies working on silicon
  - 6 PHY implementations at last interop event
  - Endorsed by USB-IF, Bluetooth SIG
- WiMedia has :
  - 9 of top 10 semiconductor companies
  - 7 of 7 major CE companies
  - 3 of top 4 mobile handset companies

# What is the WiMedia Alliance?

- A global non-profit organization
- Define and certify a UWB PAN radio which share with partner SIGs
- Regulatory engagement
- Best practices recommendations
- Standards Development
  - Avoid interference with dissimilar radios
  - Avoid need for multiple radios to insure connectivity
  - Maximize economies of scale

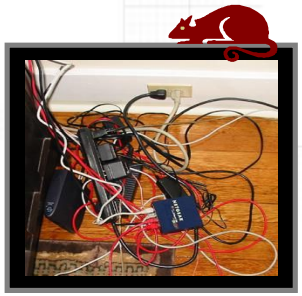
# WiMedia Common Radio Platform



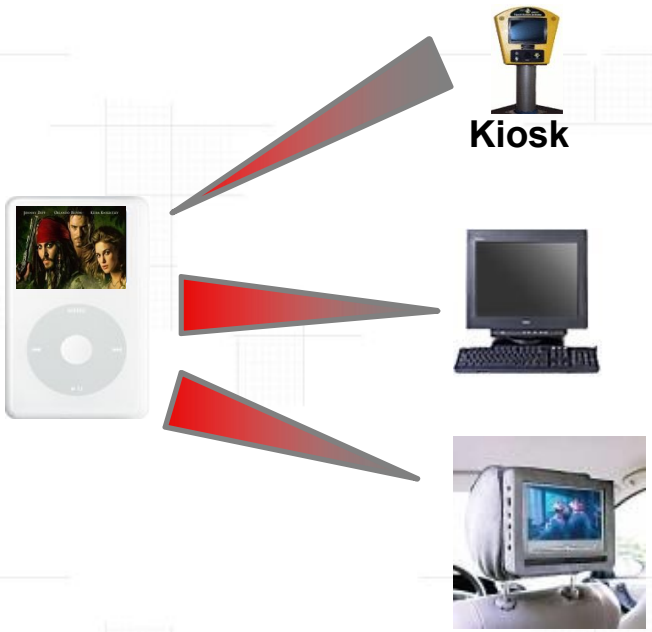

*PAL: Protocol Adaptation Layer*

# Emerging Applications & Services

- Eliminate “rat’s nest” wiring
  - PCs and peripherals
  - Home entertainment

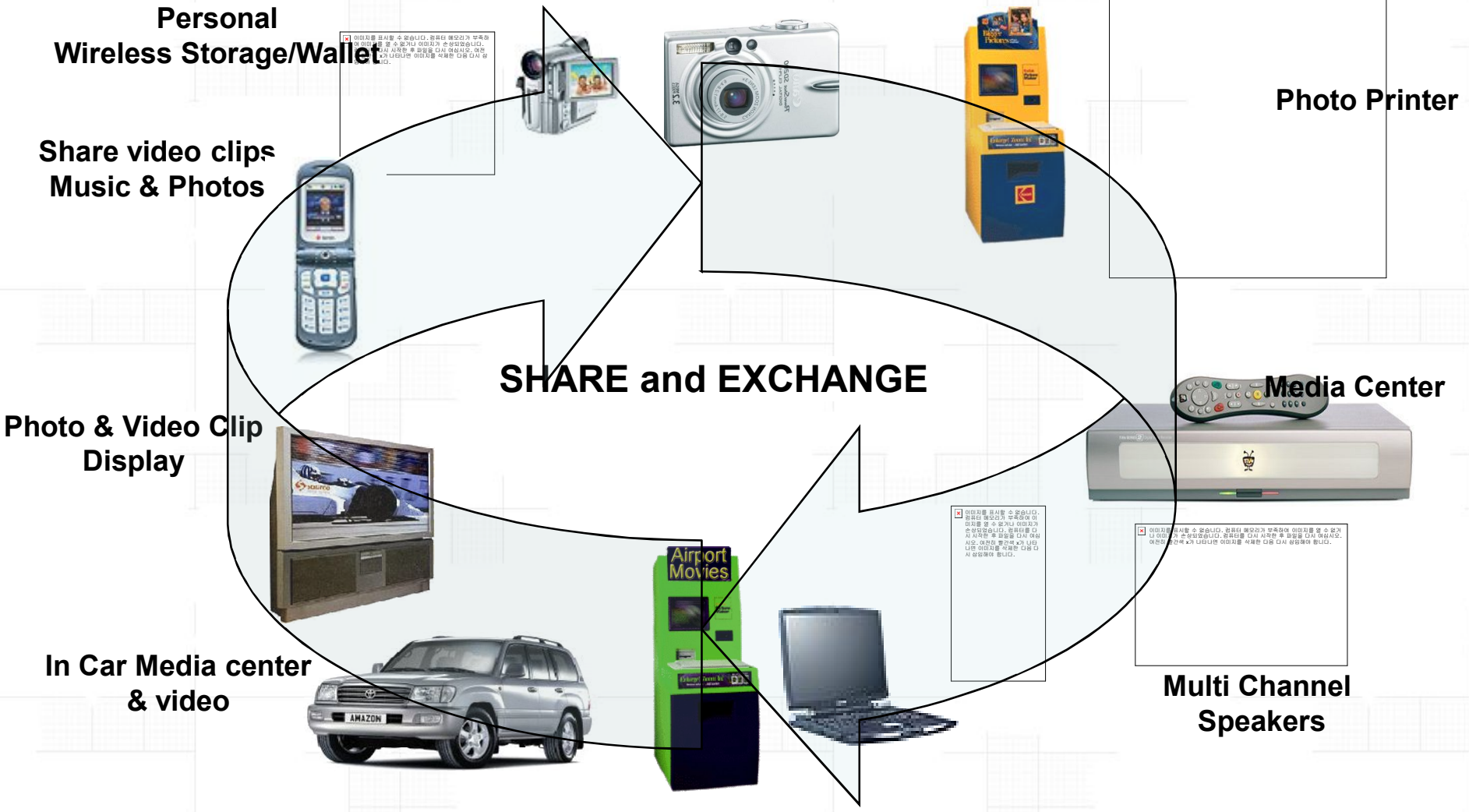


- “Sync and go”
  - Download media content to handheld devices (movies etc)
  - Upload content to PC / STB (pictures, calendars etc)




- Multimedia streaming
  - Playback content from mobile to monitor or TV

# Vision : Creating WPAN Models and Product



# WiMedia Status & Roadmap

## What is the status?

# WiMedia Status & Roadmap

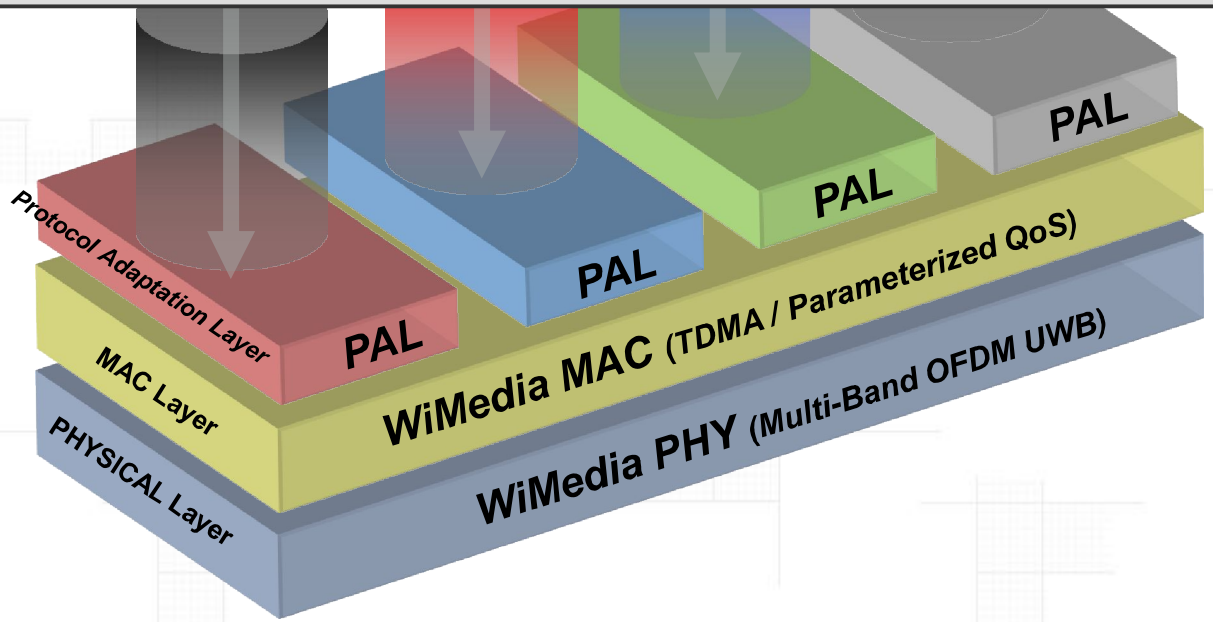
## Rollout Progress - WiMedia Radio Platform

**Radio Chips (PHY):**

✓ 19 chipsets

**Platform Products (PHY + MAC):**

✓ 21 PHY + MAC implementations



# WiMedia Status & Roadmap

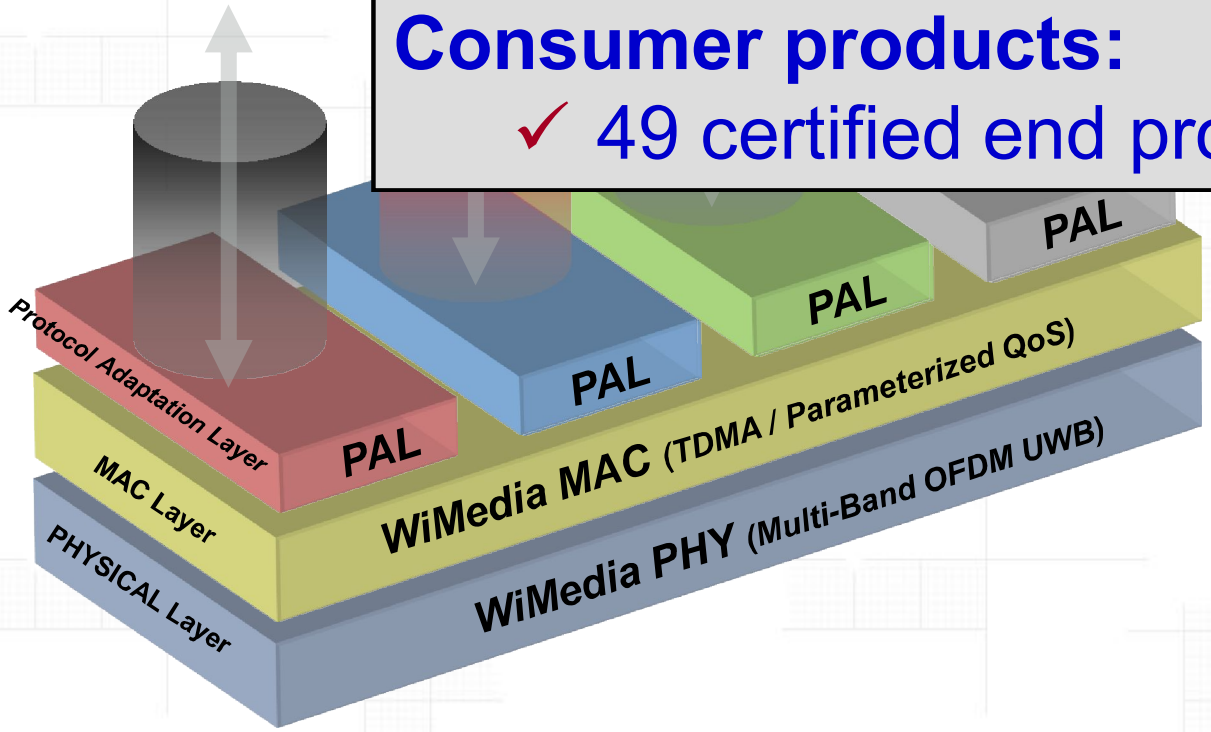
## Rollout Progress -

**Computer products:**

✓ 12 laptop computers

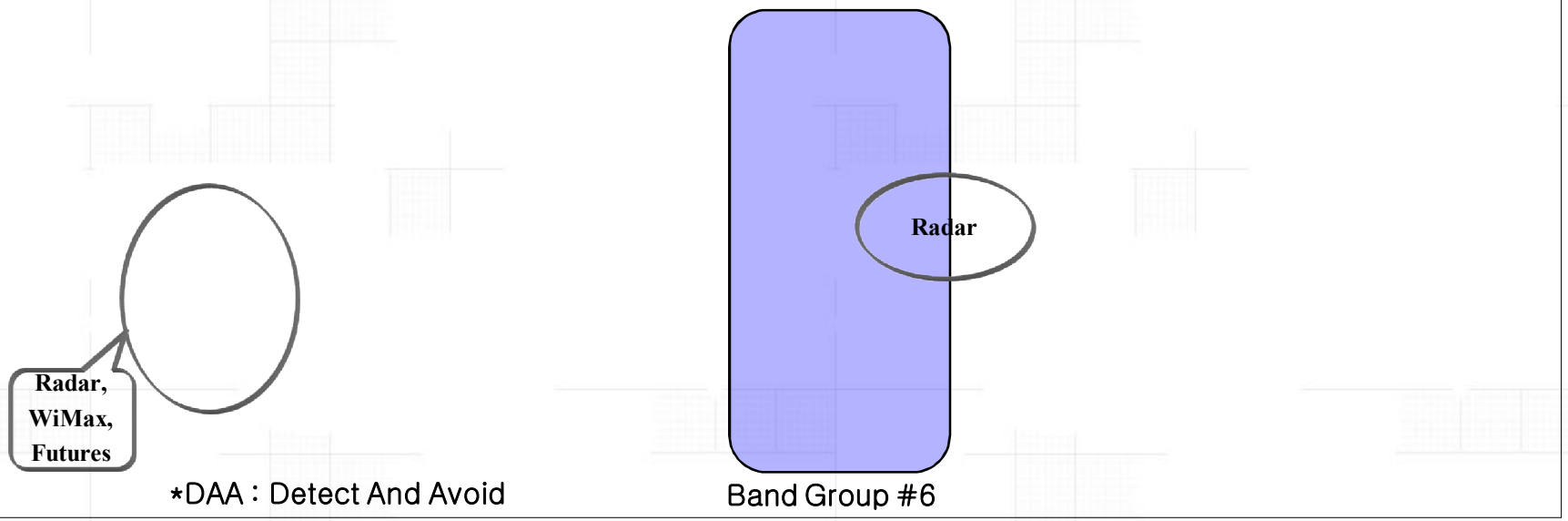
**Consumer products:**

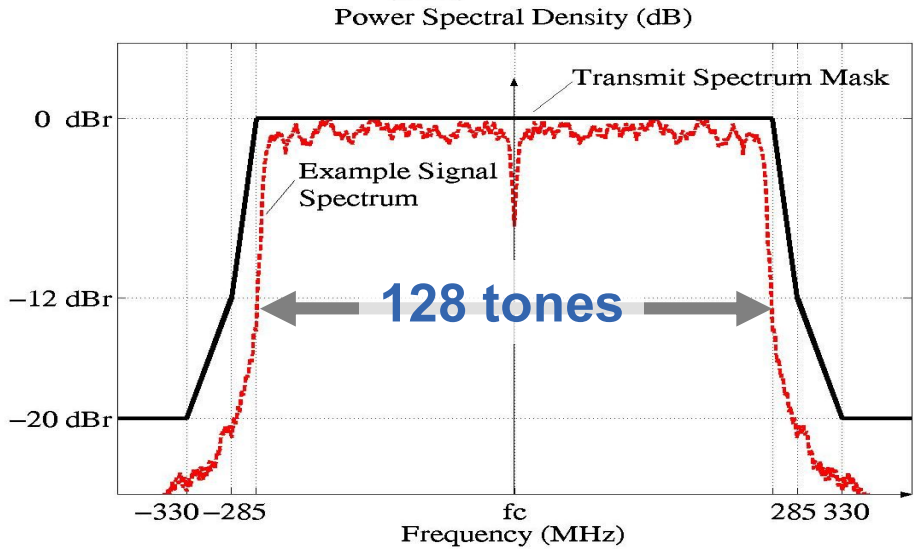
✓ 49 certified end products




WiMedia **UWB Radio Platform**

# Regulation

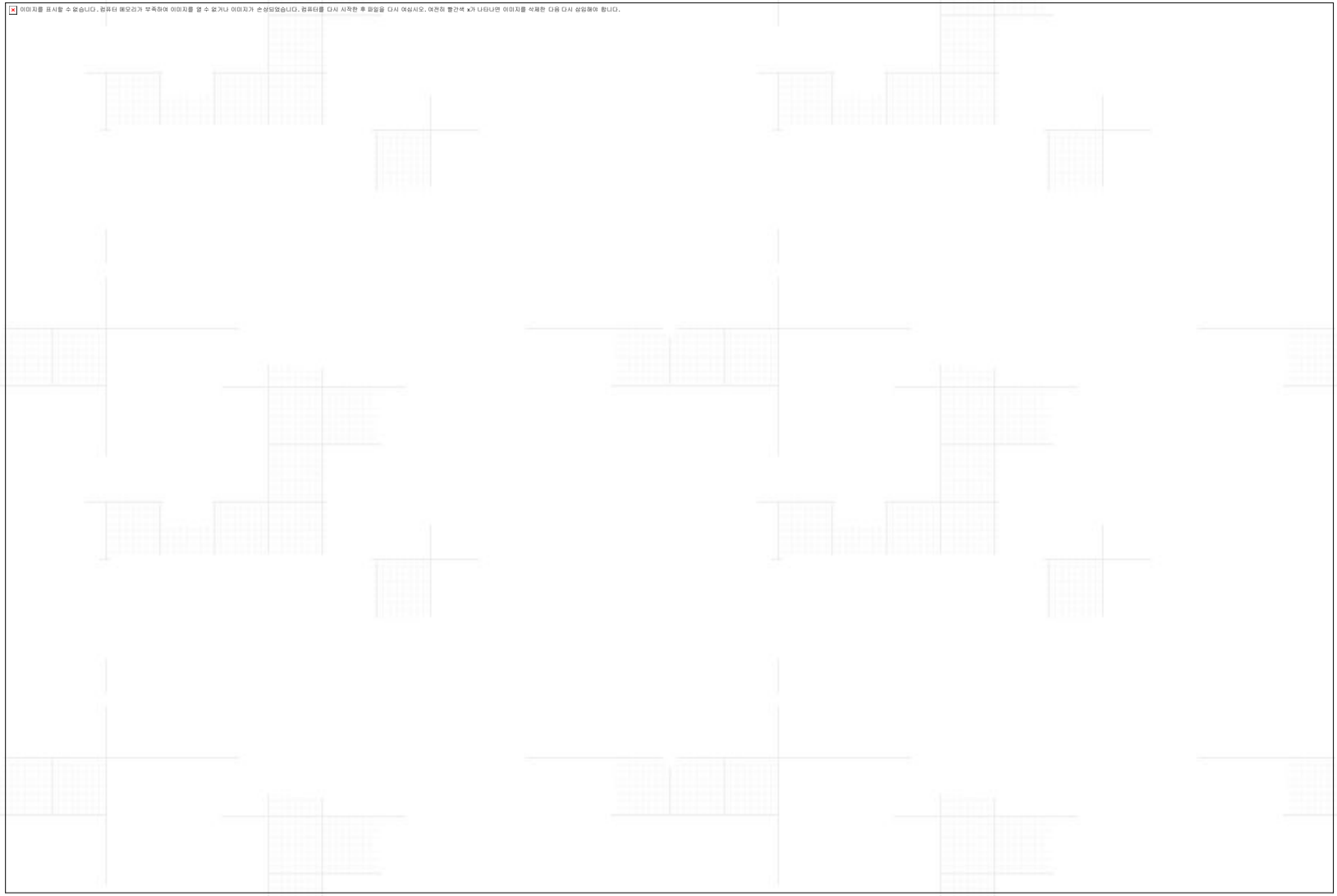



WiMedia PHY Specification 1.1

- 53.3-480Mb/s
- Hopping (3 band) and non-hopping channel codes
- Each band occupies 528 MHz
- PHY signaling
  - 128 tone OFDM
  - Tone width: 4.125 MHz
  - Tone modulation: QPSK/DCM
  - Time and frequency spreading
  - Forward error correction

# Regulation - Cont'd



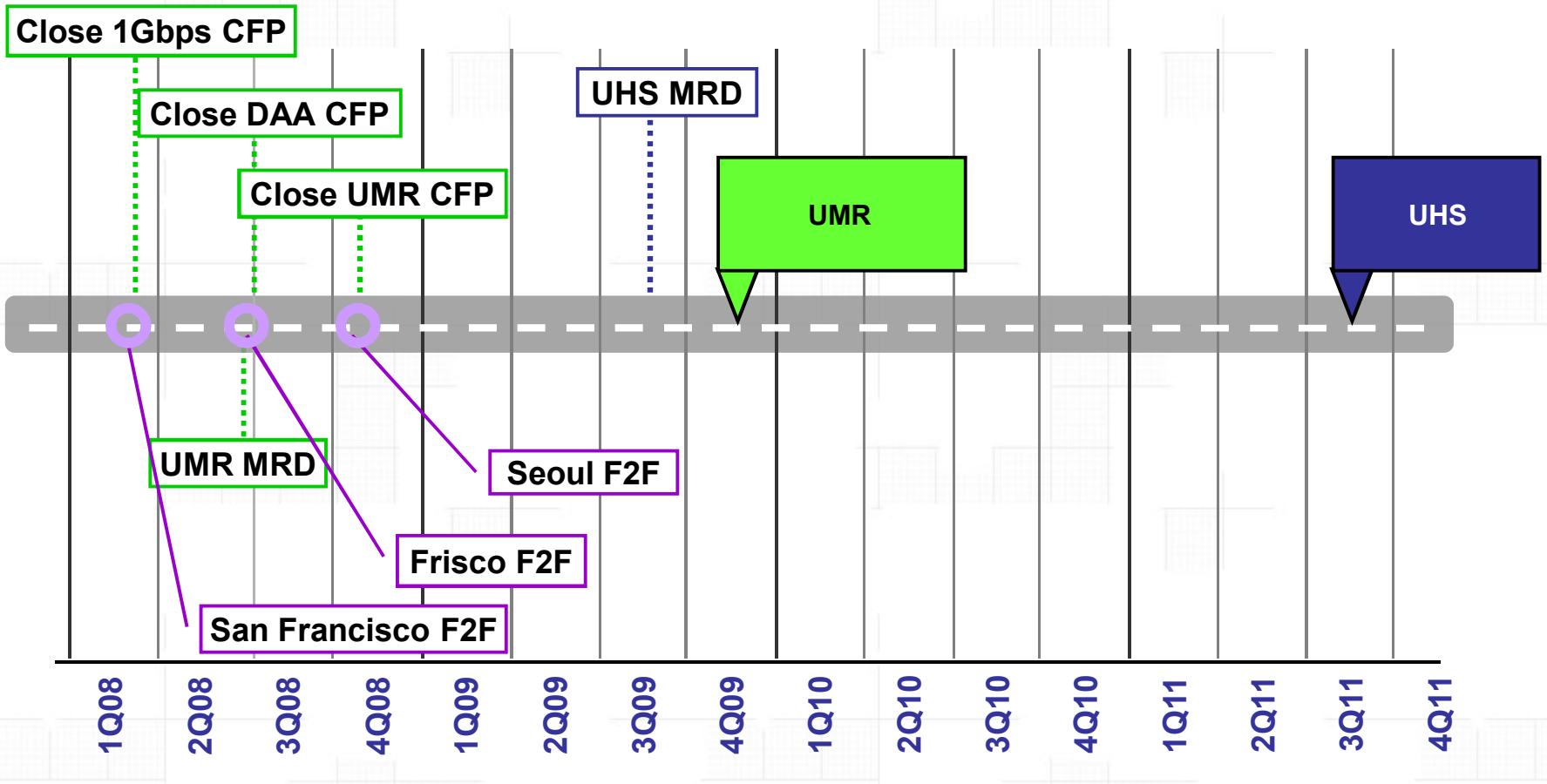
# Next Steps

- Overall, the event went well. Exhibitors were happy with quality of attendees, venue and turnout.
- 2008 Meetings:
  - *June 17 – 19, 2008 – Member Meeting*

    *Westin Stonebriar Hotel, Frisco, Texas*
  - October 21-23, 2008 – Member Meeting & Open House

    JW Marriott Hotel, Seoul, Korea
- 2009 Meetings:
  - March – Member Meeting (Seattle, Washington)
  - June – Member Meeting & Open House (Berlin or Dublin)
  - October – Member Meeting (Chicago/Atlanta/Miami)

# New WiMedia UWB Roadmap




Marker is at C&I Test Specs Ready, UMR = Ultra-Mobile Release, UHS = Ultra High Speed Release

# WiMedia Strategy

- Emerging Applications - Augmented Reality

  - Navigation
  - IR Aided Person/Animal Avoidance
  - RADAR Aided Fog Assistance

Automobile Console

# UWB Standards

- **ECMA-368 (ISO/IEC 26907: HR Ultra-Wideband PHY and MAC)**
  - Defines PHY and MAC layers for a decentralized, complex system
  - Employs the unlicensed 3.1 to 10.6 GHz UWB spectrum
  - Mandates support of at least 53.3, 106.7 and 200 Mb/s to ensure a reasonable consumer experience
- **ECMA-369 (ISO/IEC 26908: MAC-PHY Interface for ECMA-368)**
  - Defines the ECMA-368 companion interface specification
  - Enables interconnectivity for separate implementations of ECMA-368 PHY and MAC layers

# WiMedia UWB Applications

*WiMedia UWB 응용*

# Introducing Certified Wireless USB

- USB is the most successful interface in the PC industry
  - With more than 2.9 billion legacy wired USB connections in the world
- Soon, these same fast, interoperable connection will become available in the wireless world
  - Certified Wireless USB from the USB IF
- WUSB combines the speed and security of wired technology with the ease-of-use of wireless technology
- WUSB ensures consumers have an easy, secure way to connect their home, office and mobile devices without a cable - without sacrificing speed

# Wireless USB Background

- Wireless USB application is based on **WiMedia's UWB** common **radio platform**
- Enabling **PC peripherals, CE, Mobile** devices to connect using a common interface
- Up to **480Mbps @ 3meters**
- Created by the Wireless USB Prompter Group
  - Agere Systems, HP, Intel, Microsoft, NEC Electronics, Philips and **Samsung**
- Focused on ensuring **backward compatibility, interoperability, security**, and maintaining the guiding principles of **ease-of-use and low cost**

# Benefits of CWUSB

- Speed
  - 480Mbps @ 3meters, 110Mbps @ 10 meters
- Power Management
  - Sleep, Listen, Wake and Conserve modes
  - Enable users to use power only when the connection is needed
- Security
  - Provides optimum data security through built-in protocols and Authentication procedures
  - Encryption process during transmission
- Ease-of-use
  - Like traditional USB, WUSB is simple to install and setup
  - With the additional ease that comes with a cable-free environment
- Backward Compatibility
  - To wired USB devices

# A Waiting Marketplace

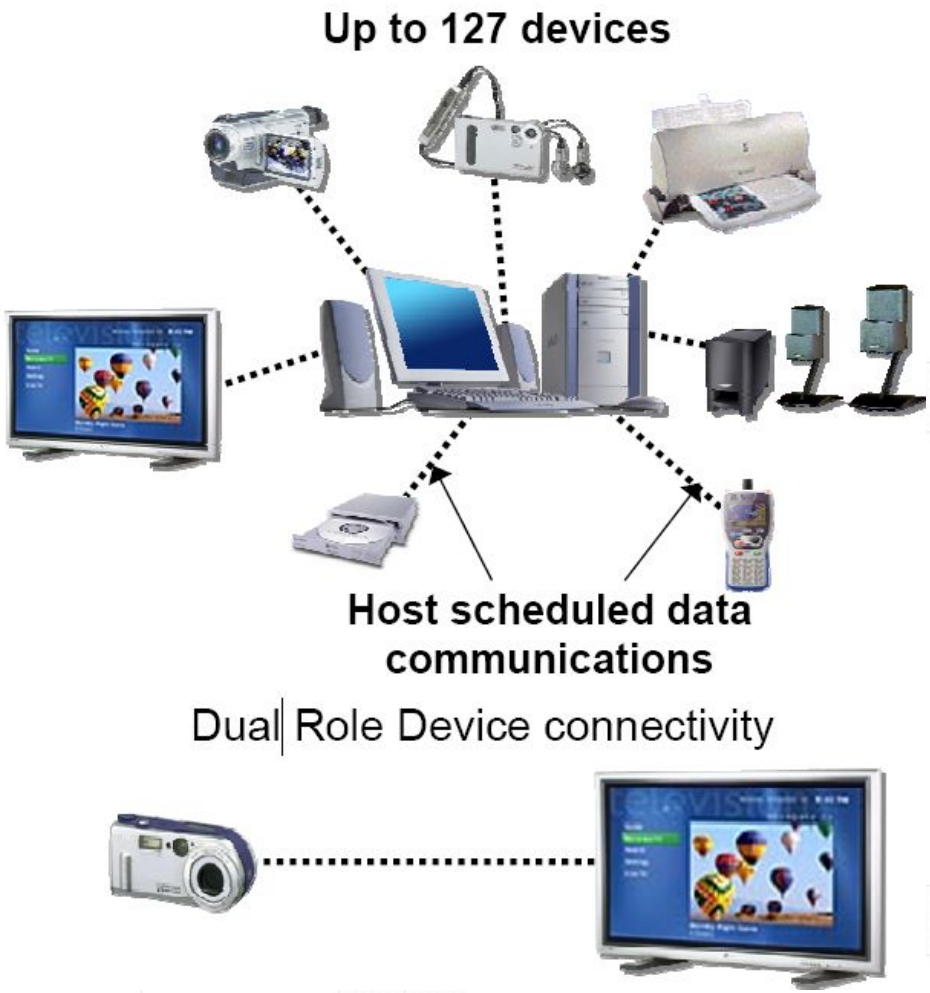
- **Consumer Electronics Segment**
  - Eliminates cable nesting for the CE component stack in digital home
  - Delivers easy installation and setup right out of the box
  - Support **multiple HDTV streams** which is a requirement for CE devices
- **Personal Computing Segment**
  - **Unwire high data rate** USB devices
  - Continuing to enable  low cost devices implementations
  - It will also make new usage models like wireless monitors a reality
- **Mobile Segment**
  - **Wireless docking station**
  - Handheld and notebook wireless linkage with resource sharing
  - **Wireless AV** display from notebooks and handhelds

# Diverse Range of Product Categories

- As wireless USB begins to make inroads into the market segment for wired USB
  - Manufactures could ship hundreds of millions of units within a few years.
  - Eventually, every PC, camera, printer, camcorder, flat panel television and mobile phone will have  a Wireless USB connection

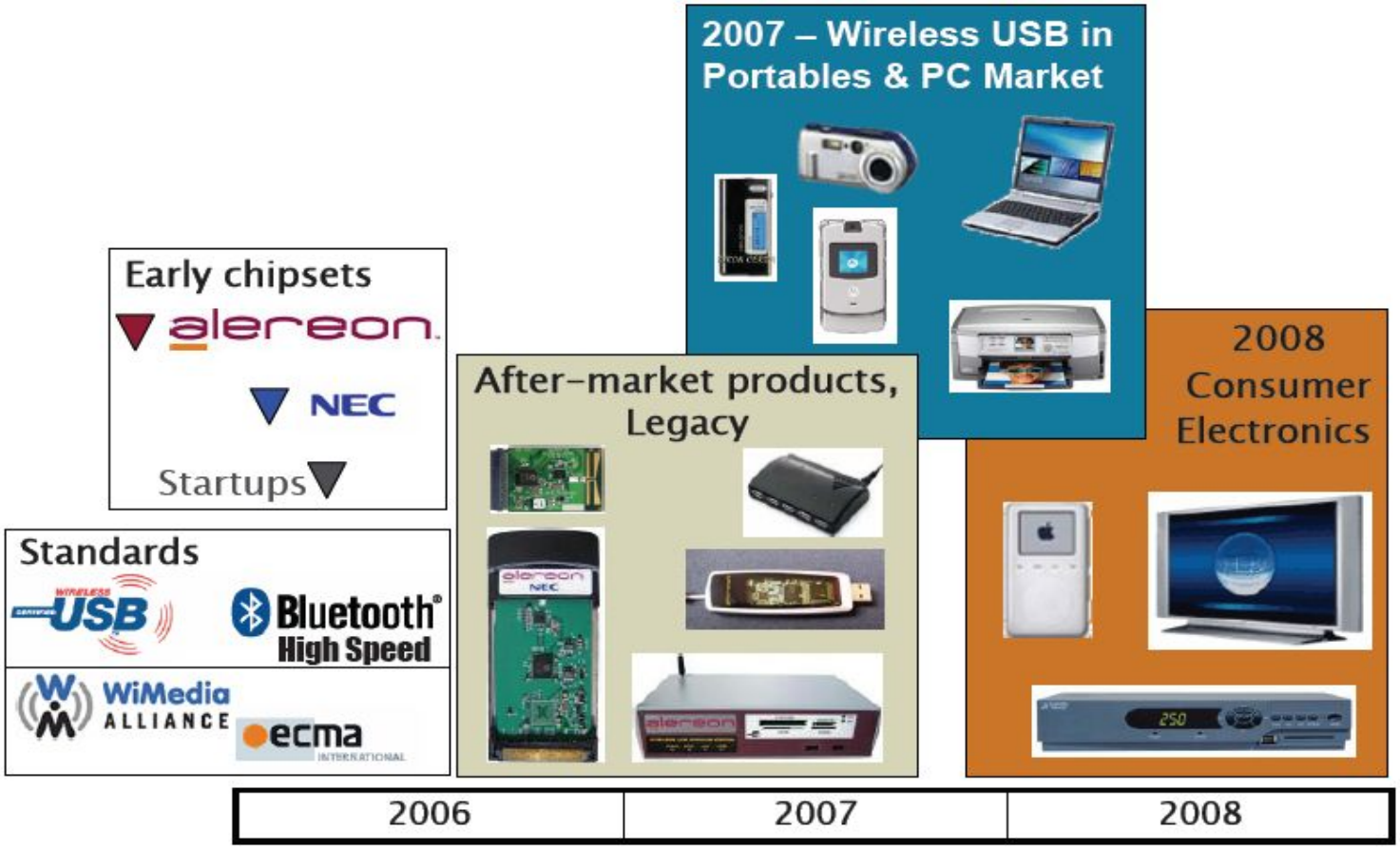
# Certified Wireless USB topology

- Hub-and-spoken connection relationship
- Connection model is a wire replacement
  - Point-to-point connections
  - Between CWUSB Host and peripheral
- Certified Wireless USB Cluster
  - CWUSB Host with one or mor peripherals (up to 127)
- CWUSB Clusters may co-exist within an overlapping spatial environment

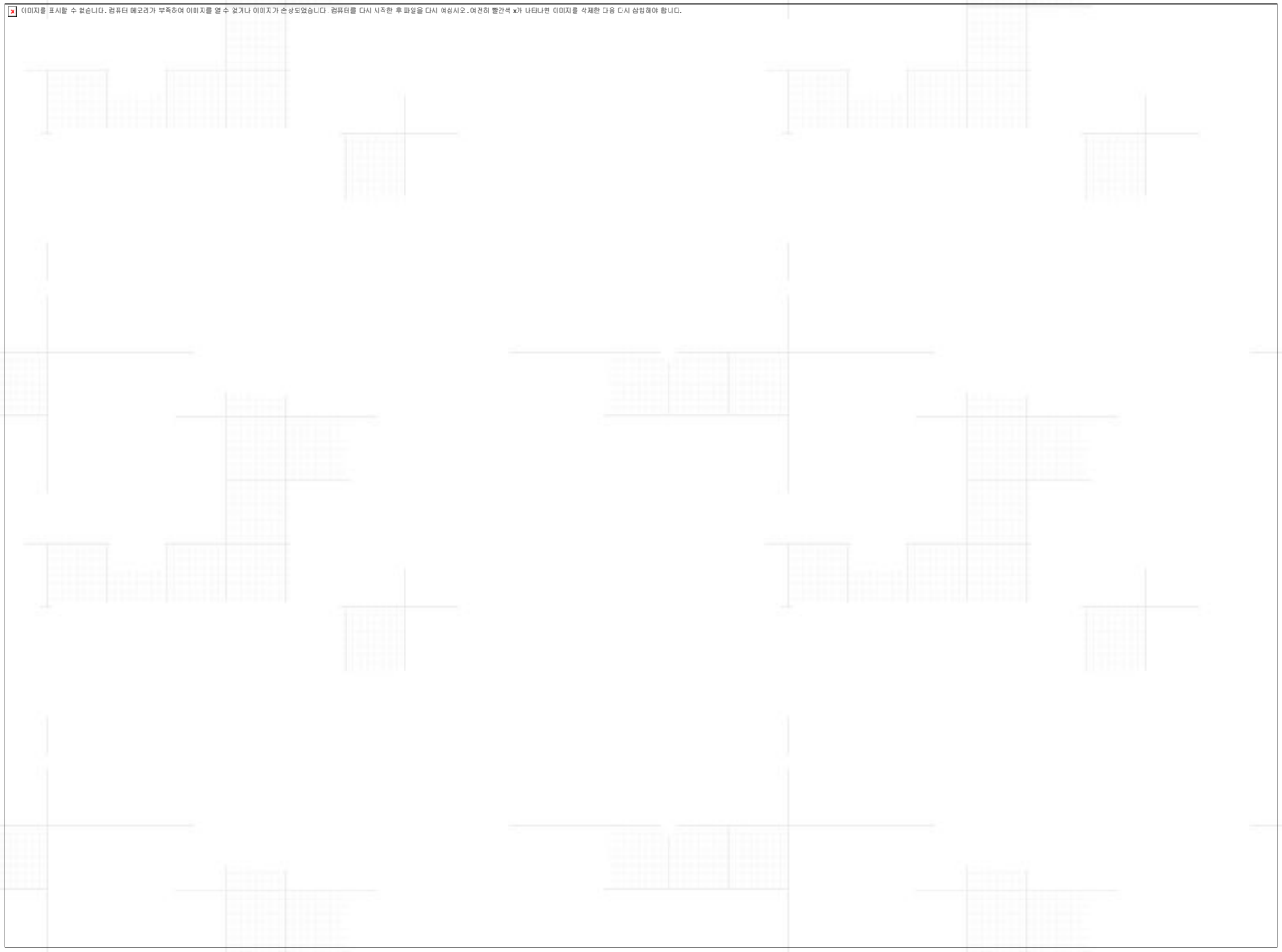


# Wireless USB Technical Trend

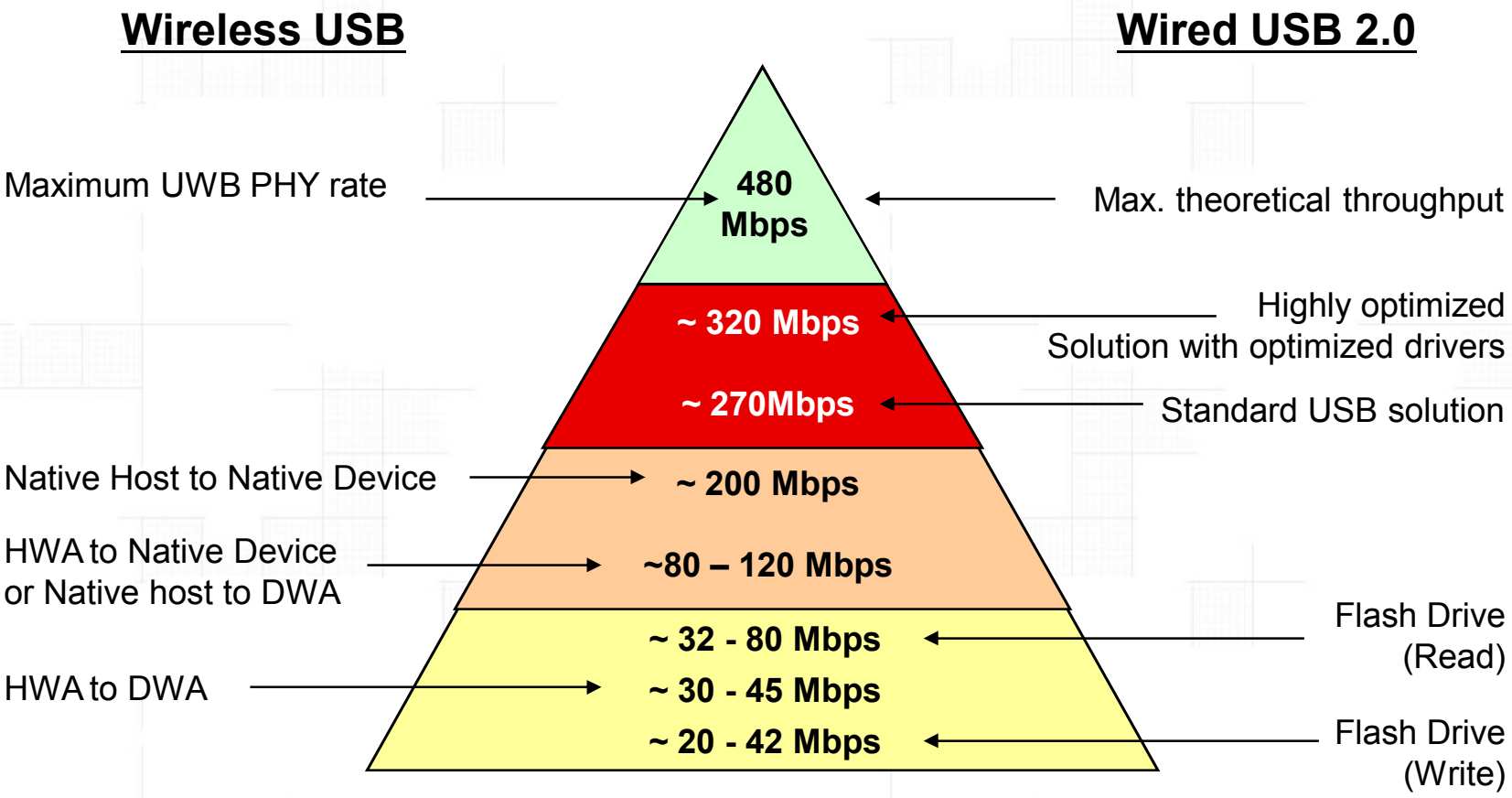
- Wireless USB Market Roadmap



# MS Vision and Industry Roadmap



# Wireless USB vs. Wired USB 2.0 Throughput




Source: Tim Higgins, Smallnetbuilder.com

# Target Use-case with Primary Codec

# H264 market Momentum

| Systems | H.264 |
|---|---|
| **TV** | |
| Eur DVB-T HD | Available e.g. LG TV at IFA2007, Philips 42PFL9742, Samsung LA40M81BD… |
| US ATSC | MPEG2 but H.264 candidate for the future |
| China | AVS (close to H.264) |
| Japan | MPEG2 but moving to H.264 |
| **STB** | IPTV available in H.264<br>Satellite available in HD |
| **DVD-HD** | Available in both Standard HD and Blu-Ray |
| **DVC** | Available in Blu-Ray DVC (Hitachi..)<br>Available in SD DVC (Panasonic…) |
| **DSC** | Not considered |
| **PMP** | Available: i.e. iPOD |
| **Mobile Phone** | Available: i.e. Nokia model |
| **Accessories** | Available: i.e. Sony LocationFree |

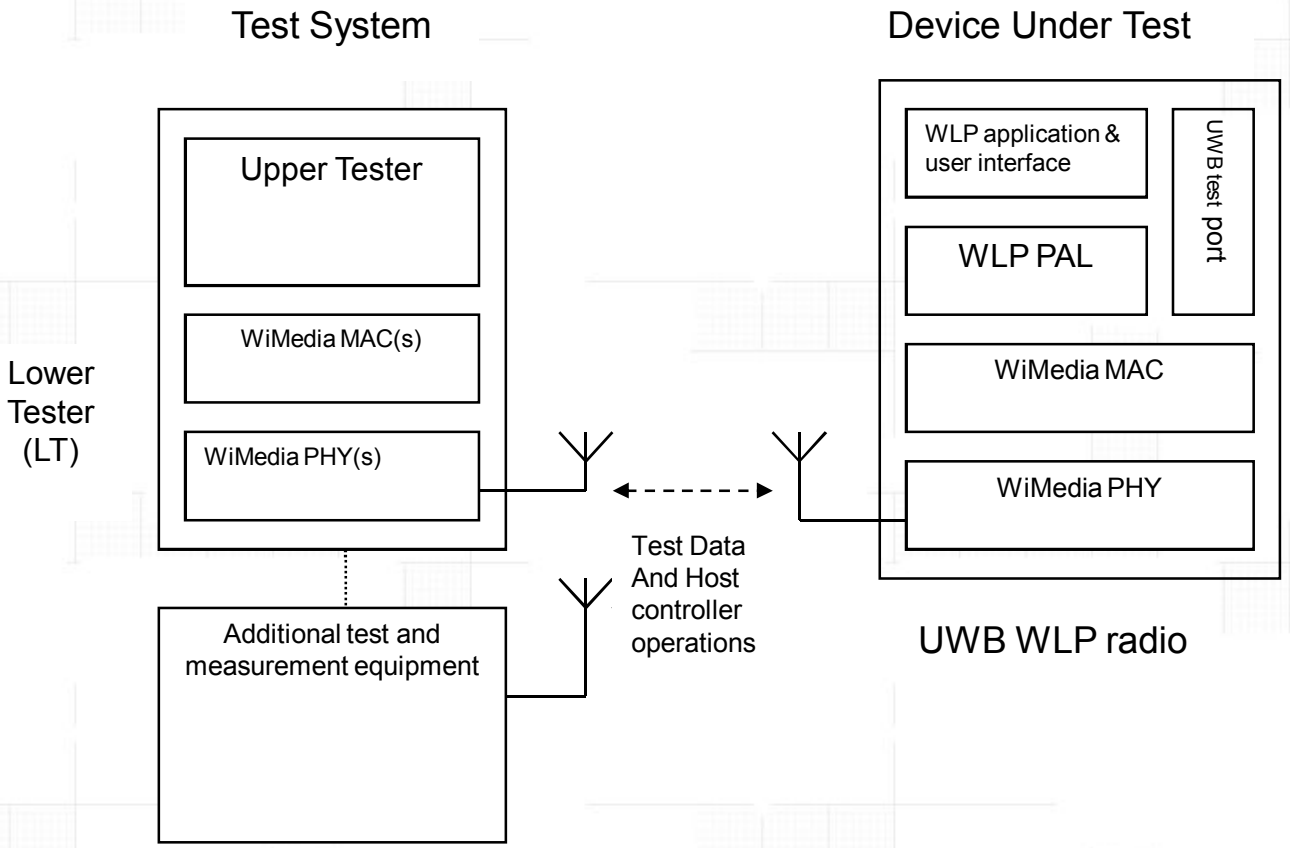
**H264 is widely adopted in Consumer systems and will develop further**

# Review: WLP Test Mode Requirements

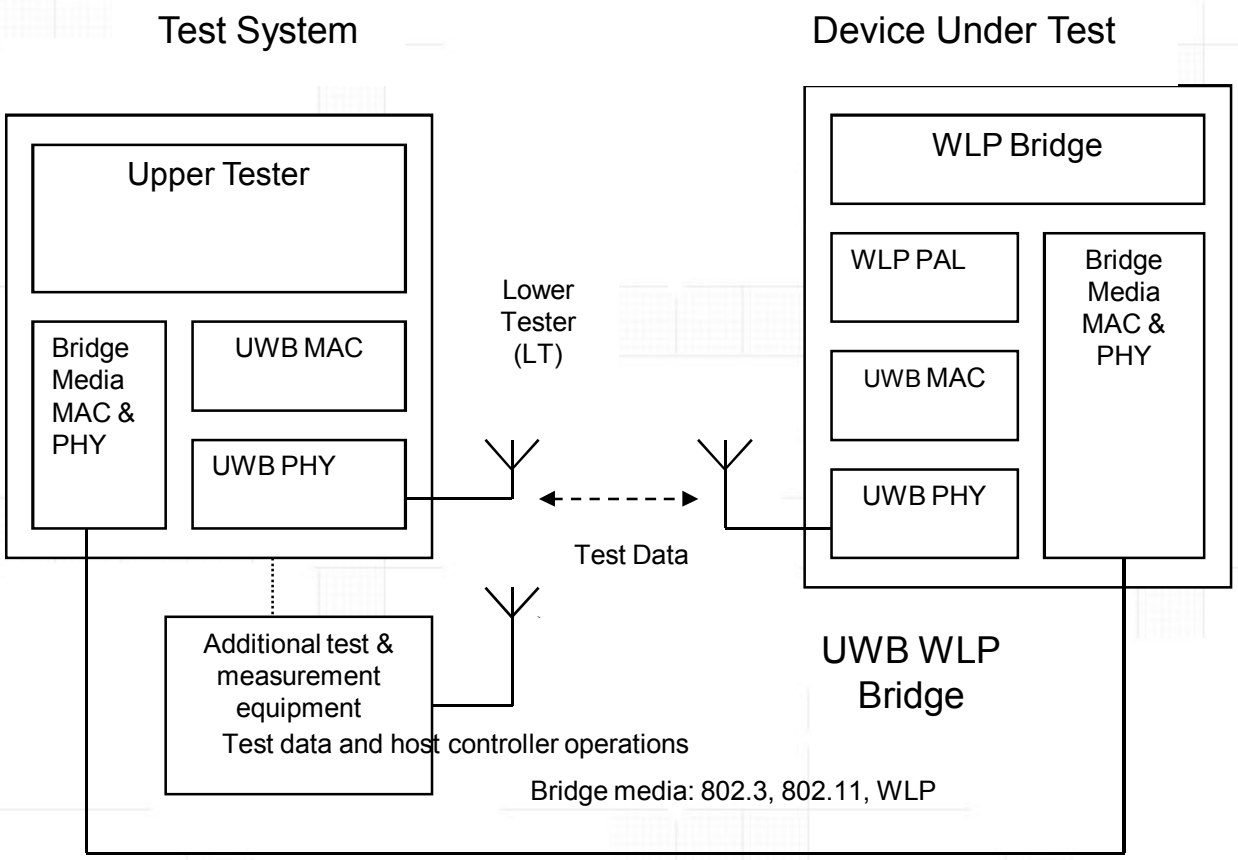
Components

1. Testing state: device is accepting test commands and providing test status
2. Means to invoke test state: manual or automatic
3. Semantics of needed test commands and responses
   - Put DUT into test case initial conditions
   - Collect DUT status and reports
4. Test command transports
   - Devices
   - WLP network adaptors
   - Bridges

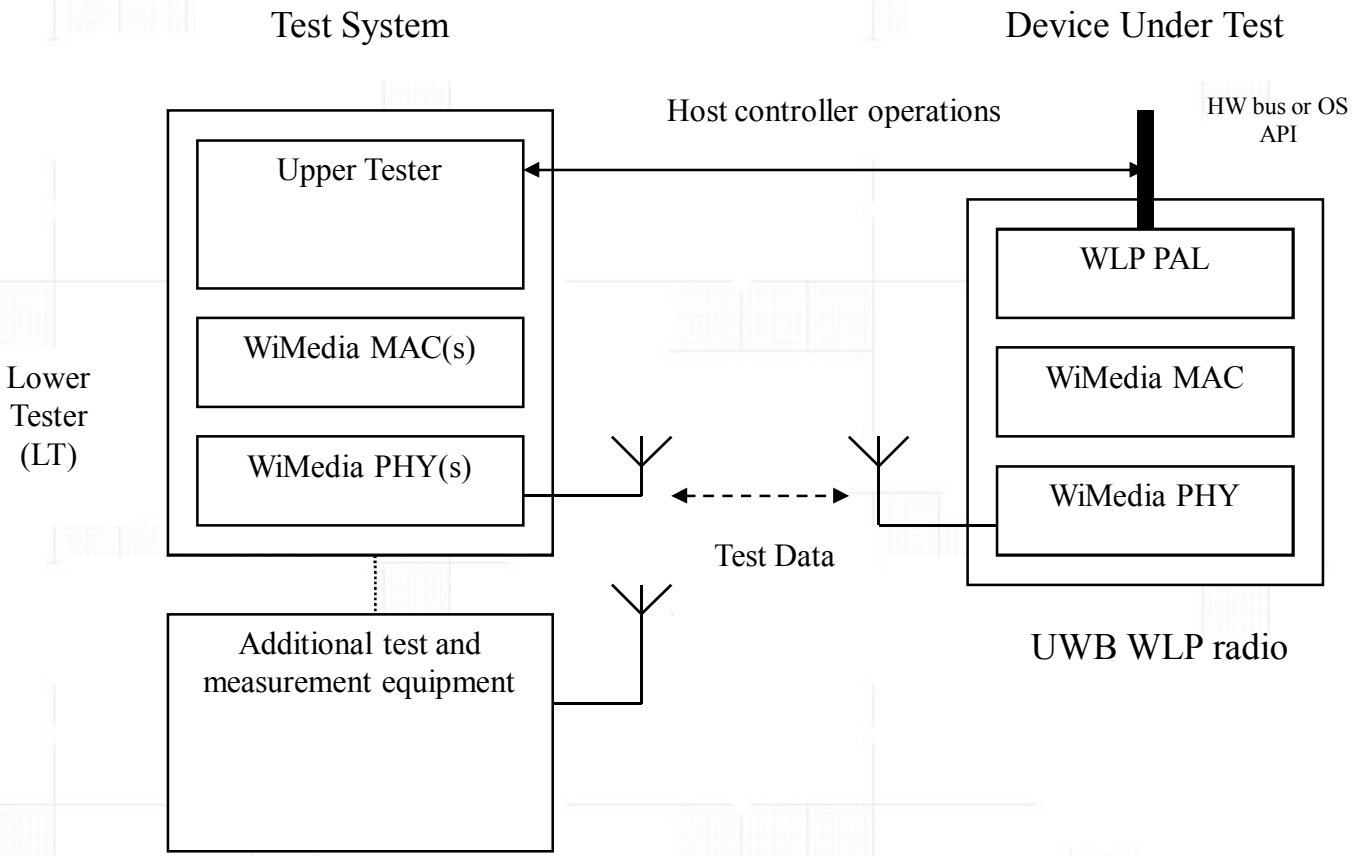
# Proposed test configuration: WLP devices



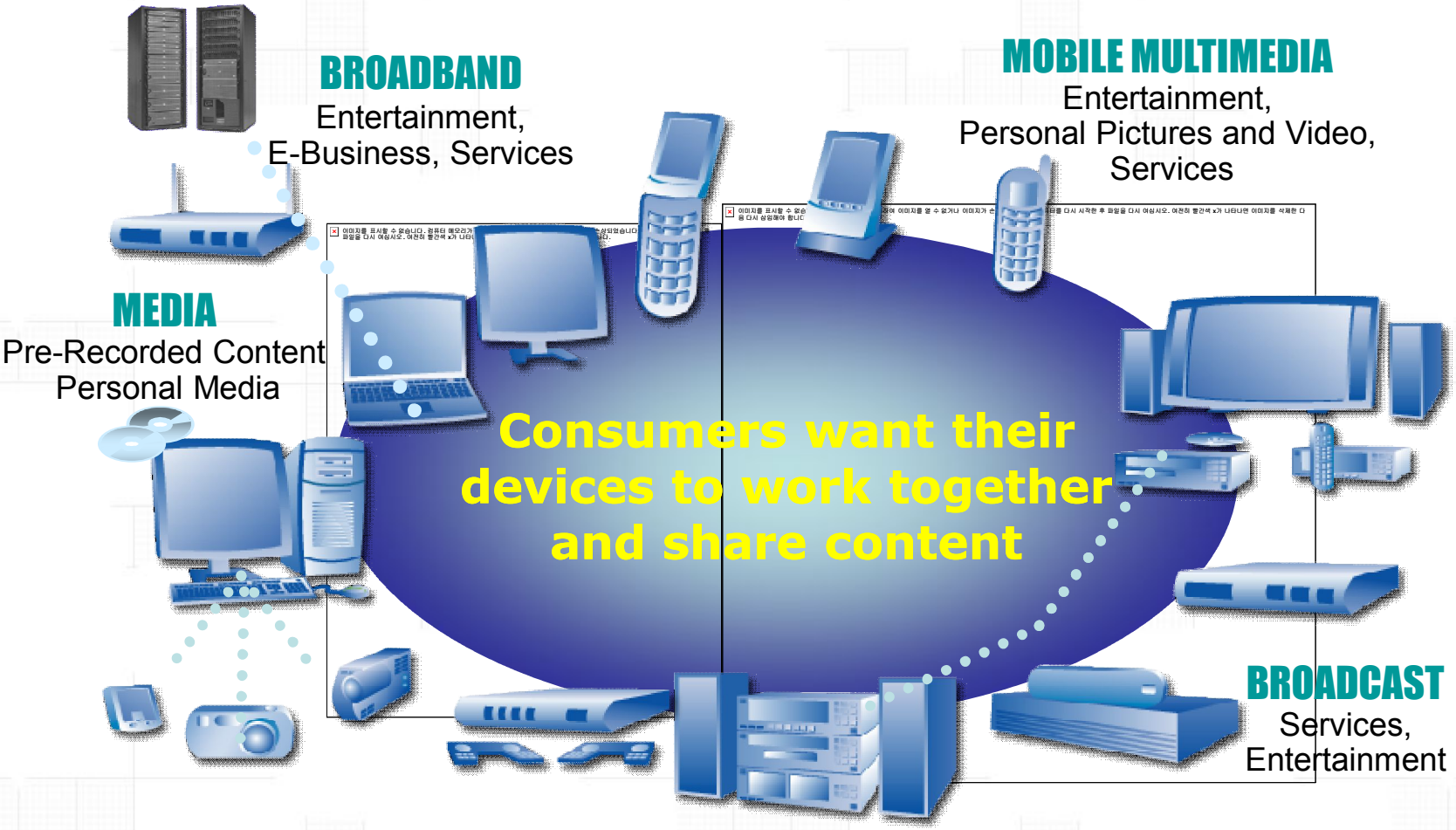
# Proposed test configuration: WLP bridges



# Proposed test configuration: WLP adaptors



# The DLNA Vision



# Service Scenario

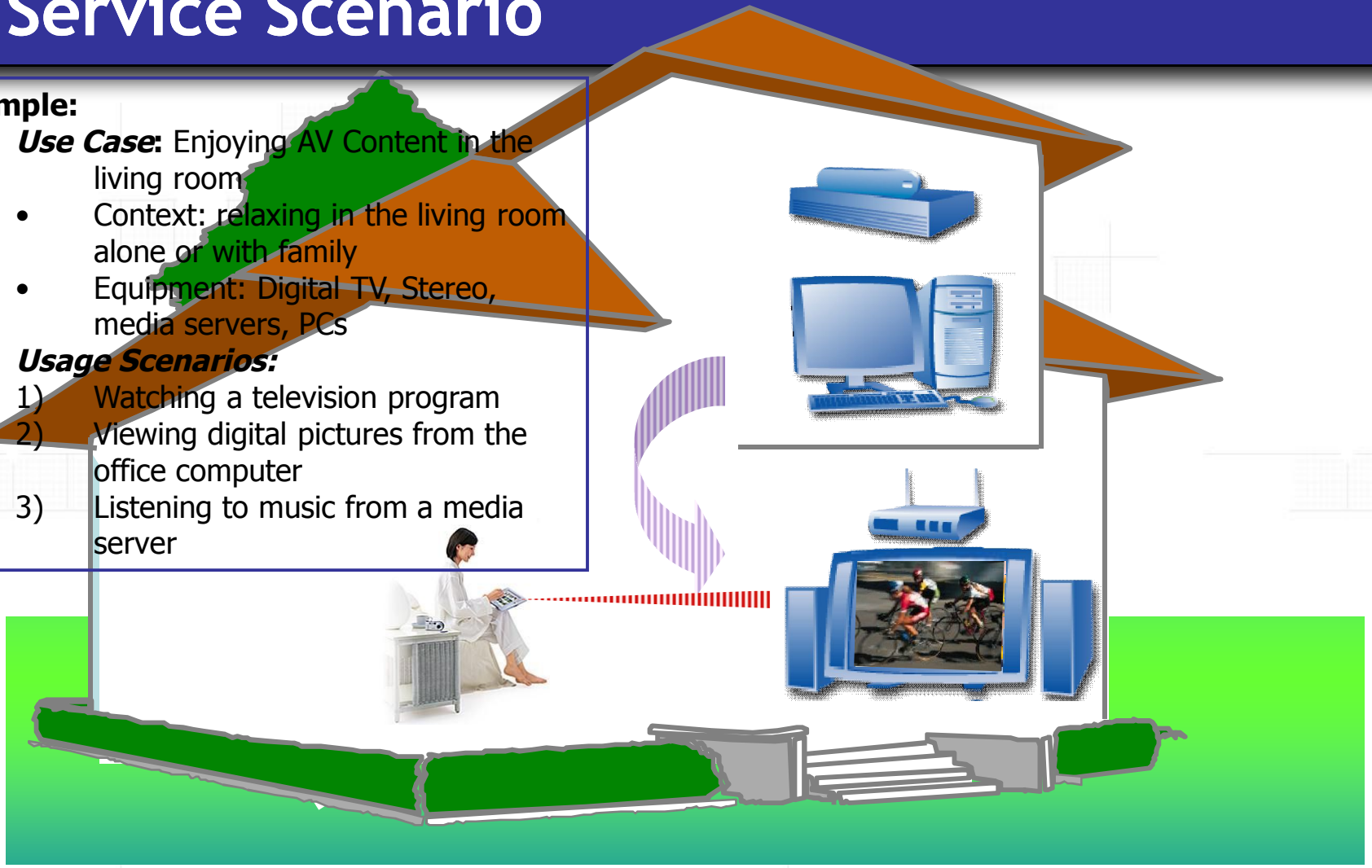
**Example:**

***Use Case*:** Enjoying AV Content in the living room

- Context: relaxing in the living room alone or with family
- Equipment: Digital TV, Stereo, media servers, PCs

***Usage Scenarios:***

1) Watching a television program
2) Viewing digital pictures from the office computer
3) Listening to music from a media server



**User is watching TV, wants to view pictures**

The devices depicted in these scenarios are for illustrative purposes only and have no relation to specific products planned by any manufacturer.

# Bluetooth – UWB

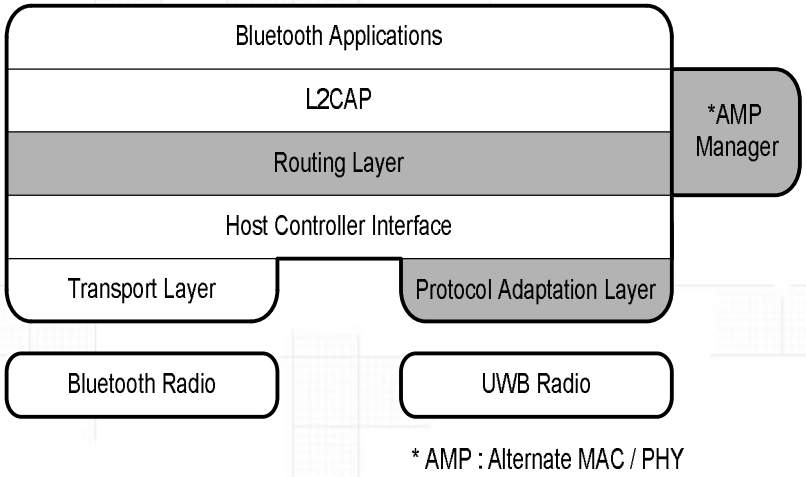
## ❑ Bluetooth 3.0 표준

- 저속 Bluetooth 응용 vs. 고속 UWB 응용
  - ➔ BT-UWB Dual Mode PHY/MAC & Bluetooth 응용 Profile 적용
- UWB는 대용량 데이터 전송 장치로 사용

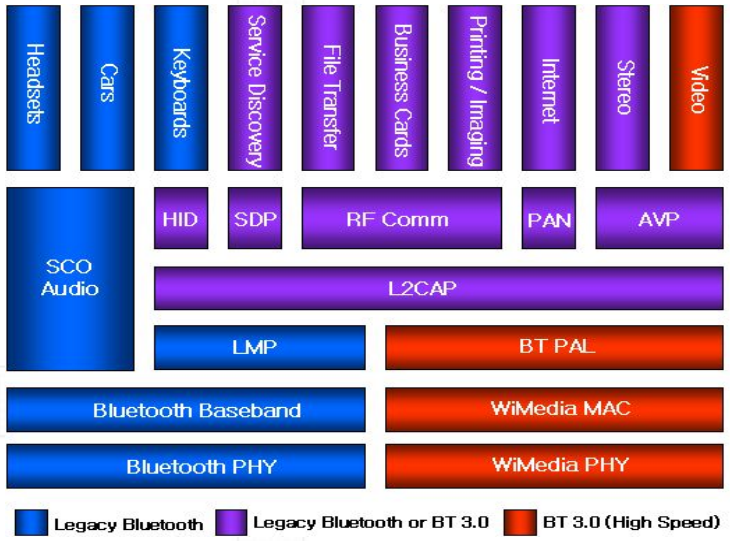
## ❑ 초고속 멀티미디어 전송 BT-UWB 기술

- 고속 UWB PHY/MAC & 고속 영상 스트리밍 Bluetooth Profile 적용
  - ➔ WiMedia MAC과의 Bluetooth와의 연동을 위한 PAL(Protocol Adaptation Layer)
  - ➔ VDP(Video Data Profile)을 이용한 응용
- UWB를 초고속 멀티미디어 스트리밍 장치로 사용

### BT3.0 Architecture



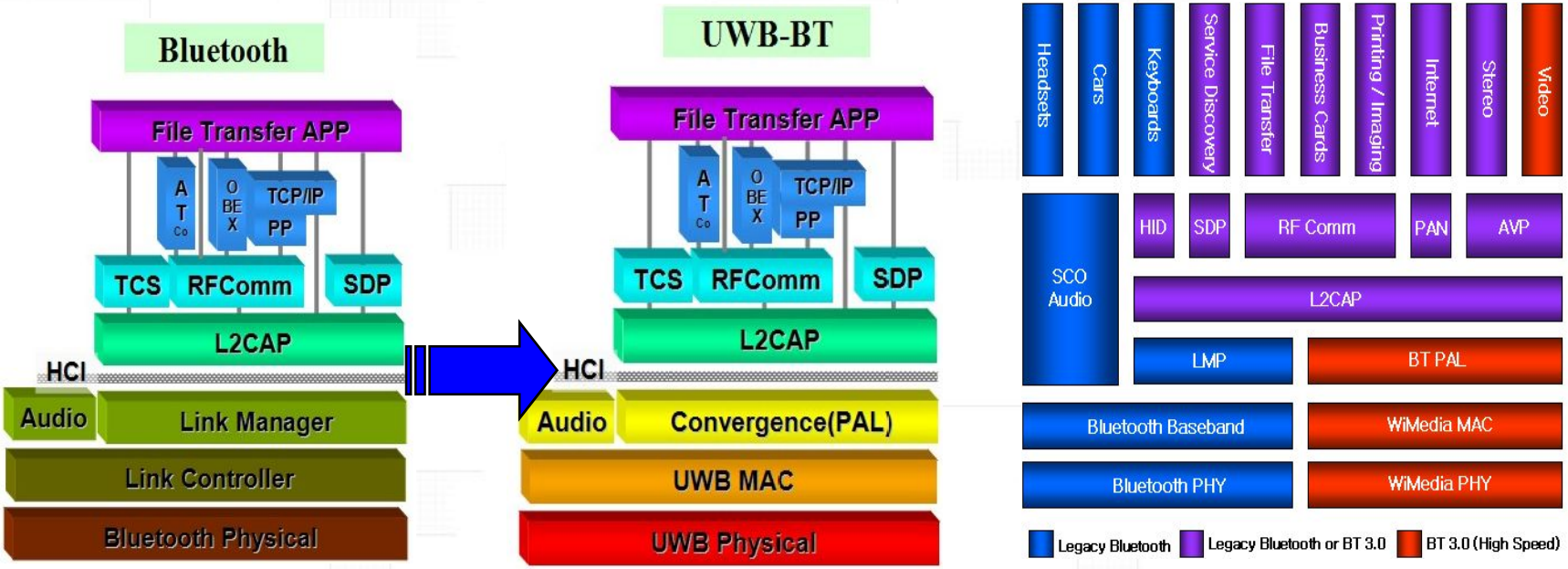

* AMP : Alternate MAC / PHY



# Bluetooth – UWB

## ❑ 초고속 멀티미디어 전송 Bluetooth-UWB 기술

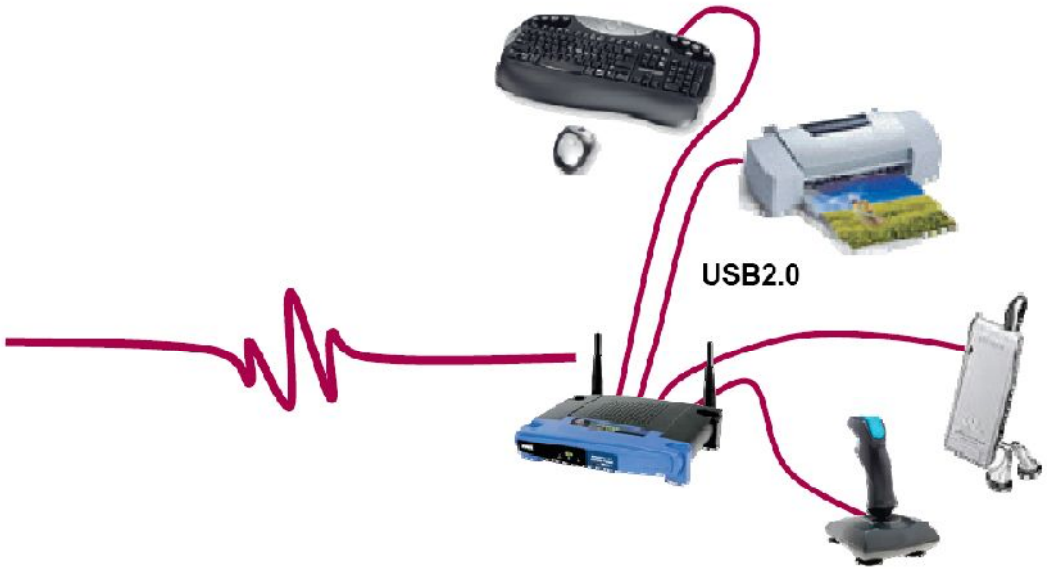
- Bluetooth 응용 프로파일을 이용하여 고속전송을 하기 위해 UWB 물리계층 사용
  ➔ Bluetooth SIG에서 표준 제정 추진 중
- BT-UWB Protocol Adaptation Layer 개발
  ➔ WiMedia MAC과의 Bluetooth와의 연동을 위한 PAL 구현
- VDP(Video Data Profile)을 이용한 응용 기술 개발
  ➔ 고속 영상 데이터 전송 Bluetooth Profile 적용



# WiMedia UWB Enabling Products

# Device Wire Adapter

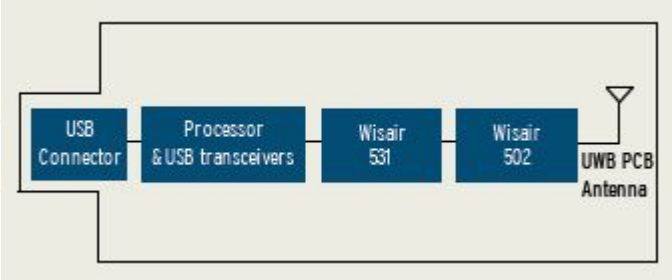
- Looks like a wireless hub
- Single chip implementation can be integrated directly into devices

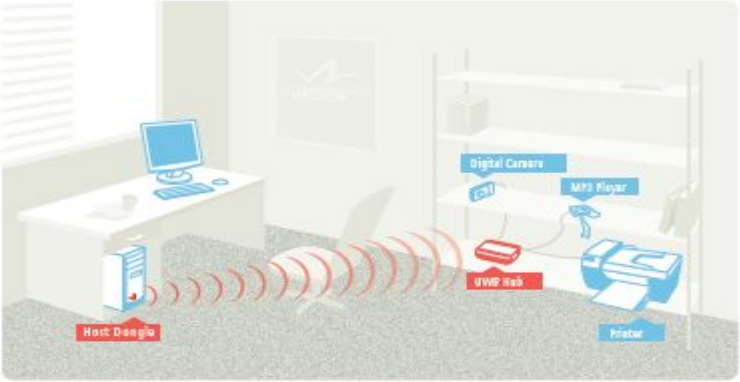



Device Wire Adapter: DWA

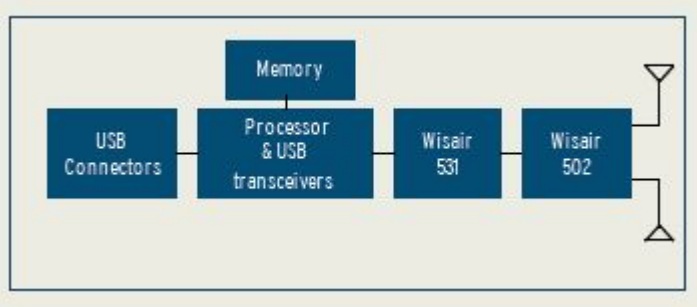
# Wireless USB Technical Trend

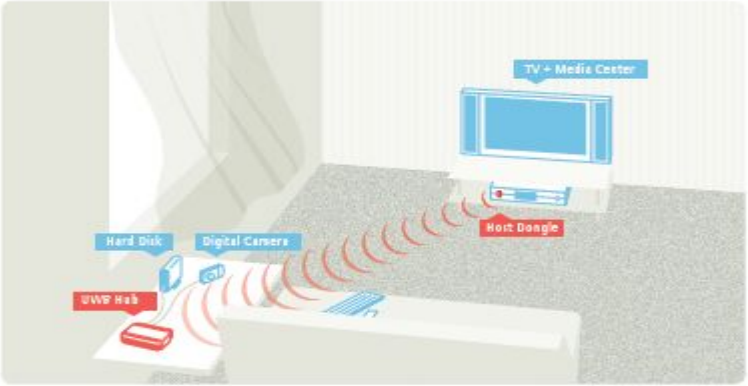
- Wisair
  - Wireless USB Block Diagram/Applications




Place USB devices anywhere in the room



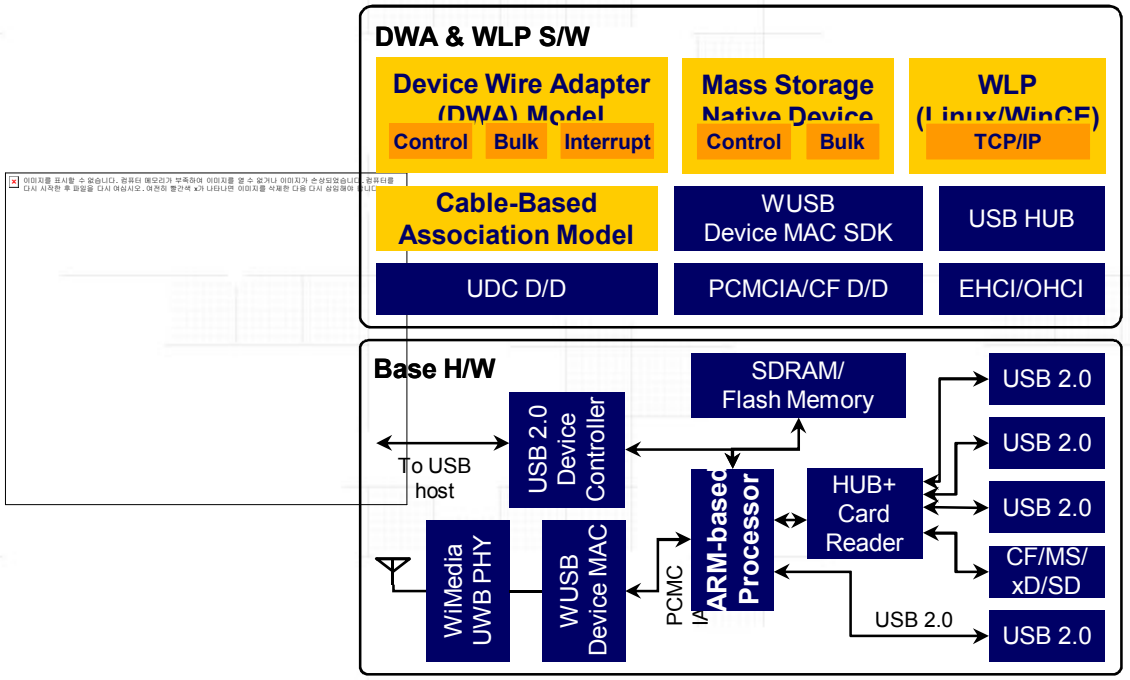

Stream media to TV from anywhere in the room

# WUSB Device Wire Platform

## WiMedia UWB based WUSB Device Wire Adapter

### HW

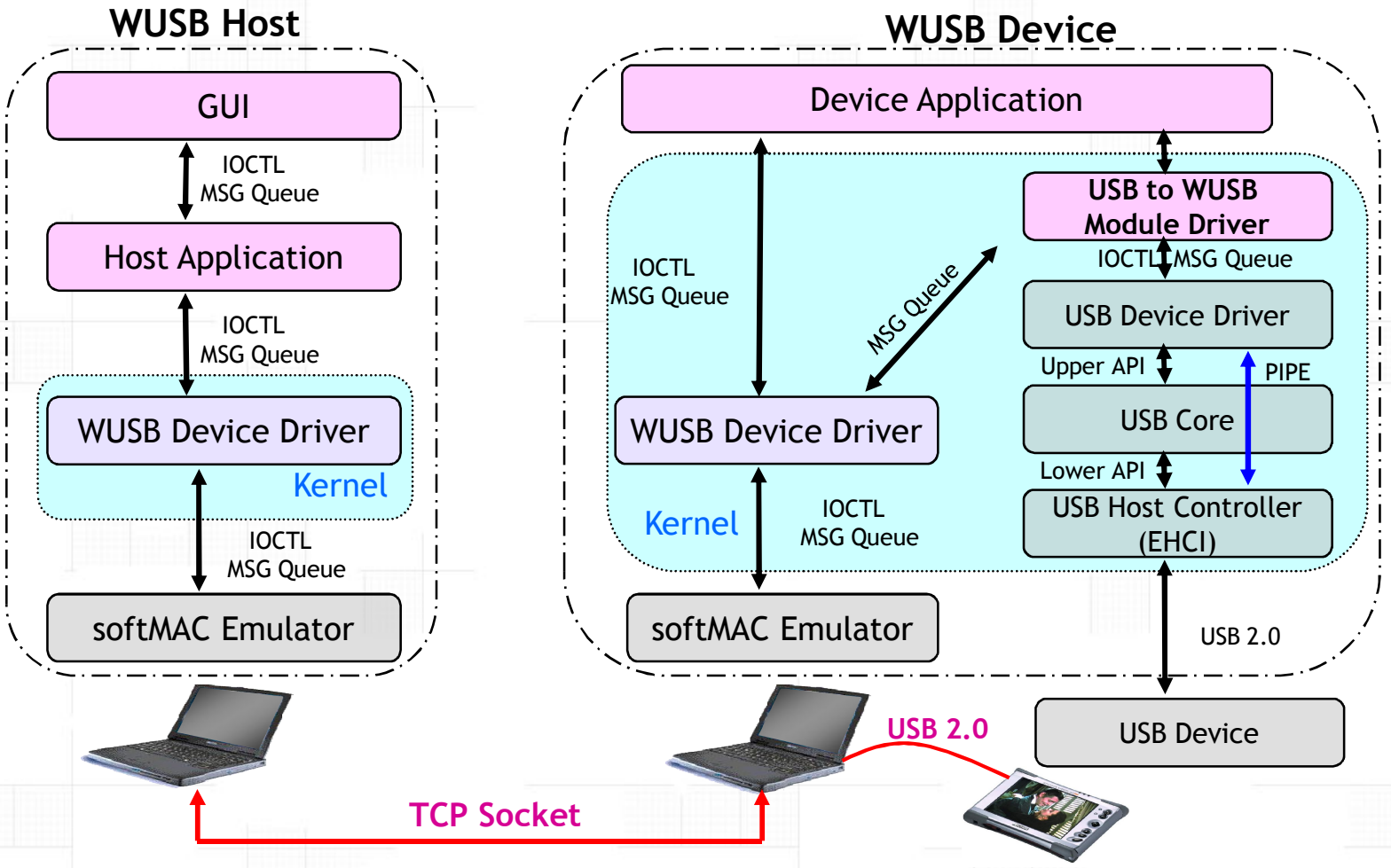
- DWA Device Driver
- WA Protocol Engine
- WiMedia Device MAC
- WiMedia PHY
- USB Host/Hub Controller
- UWB over Ethernet




### Features

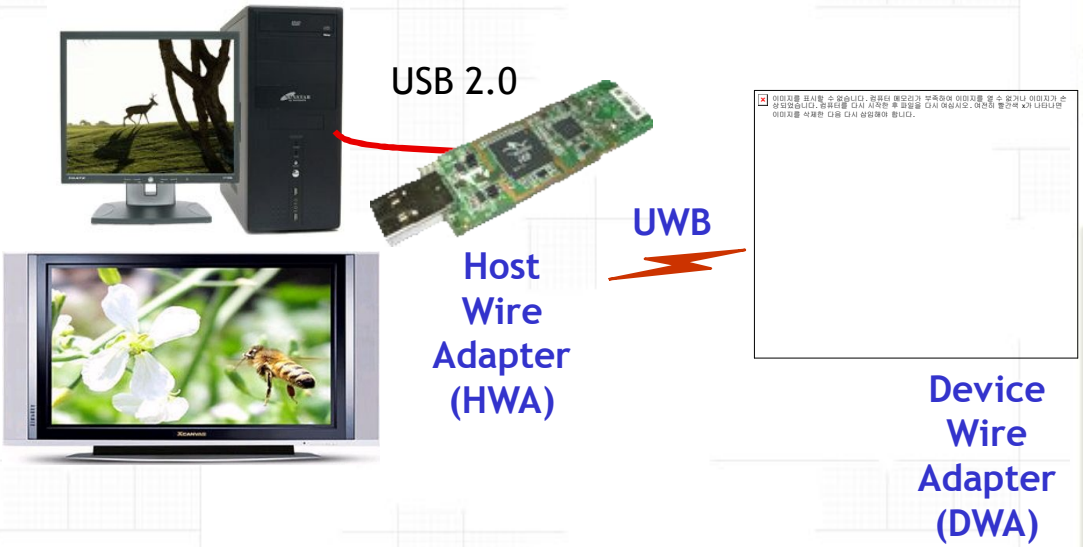
- WUSB 1.0 Device Protocol
- Design for USB Hub, Ethernet, Card reader, IDE : Docking Station..
- Legacy Device support : Wireless IPTV
- WiMedia UWB MAC/PHY Spec.

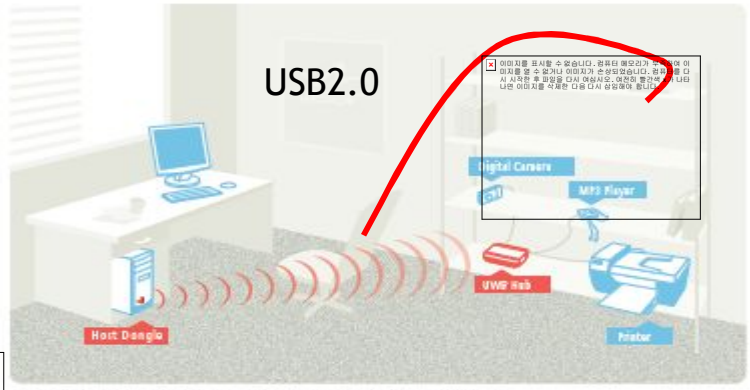
# WUSB Protocol Stack



# Wireless Services

- **Multi-Wireless Hub + Wireless Docking Station**
  - Wireless hubs and SDIO, CF, IDE MS… Interfaces
- WiMedia UWB based Certified WUSB protocol compatibility
- Patents



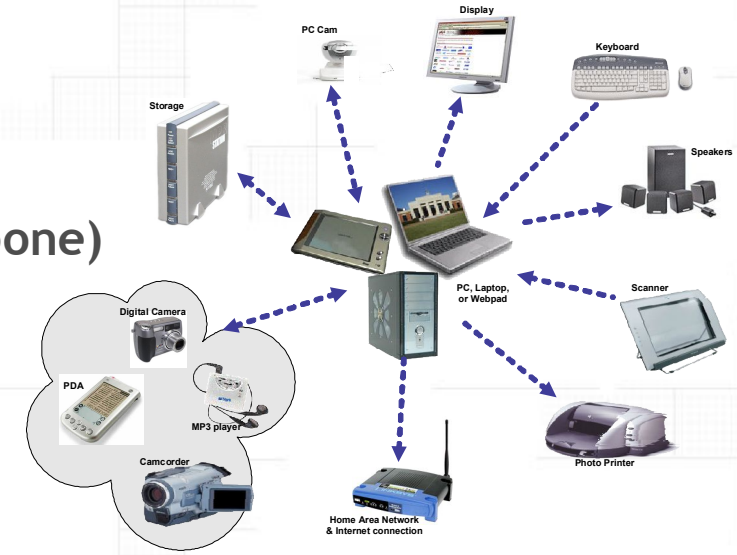



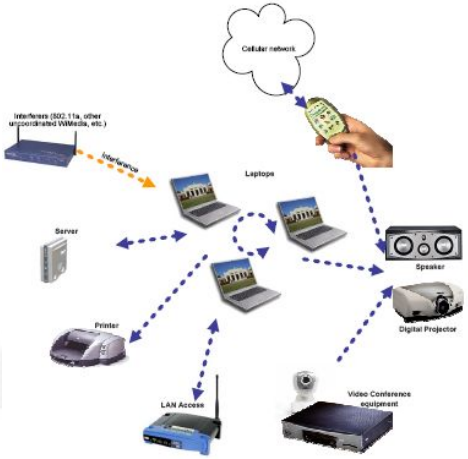

Place USB devices anywhere in the room

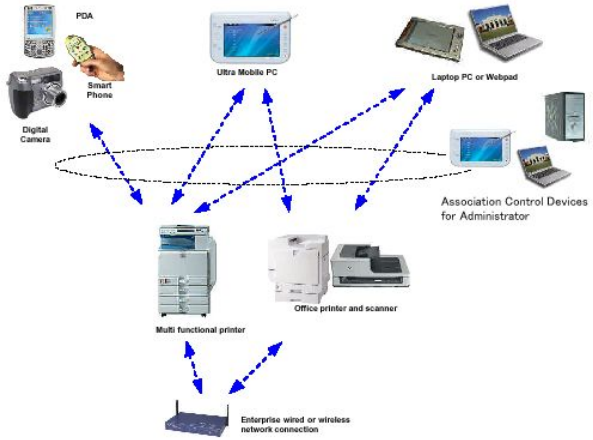
Stream media to TV from anywhere in the room

# Use Cases From DIP

- DIP Requirements
  - Use Case 1 : Entertainment
  - Use Case 2 : Public Space
  - Use Case 3 : Home Office
  - Use Case 4 : House-Wide Network (backbone)
  - Use Case 5 : Car Environment
  - Use Case 6 : Conference Board Room
  - Use Case 7 : Mobile Phone
  - Use Case 8 : Office Environment

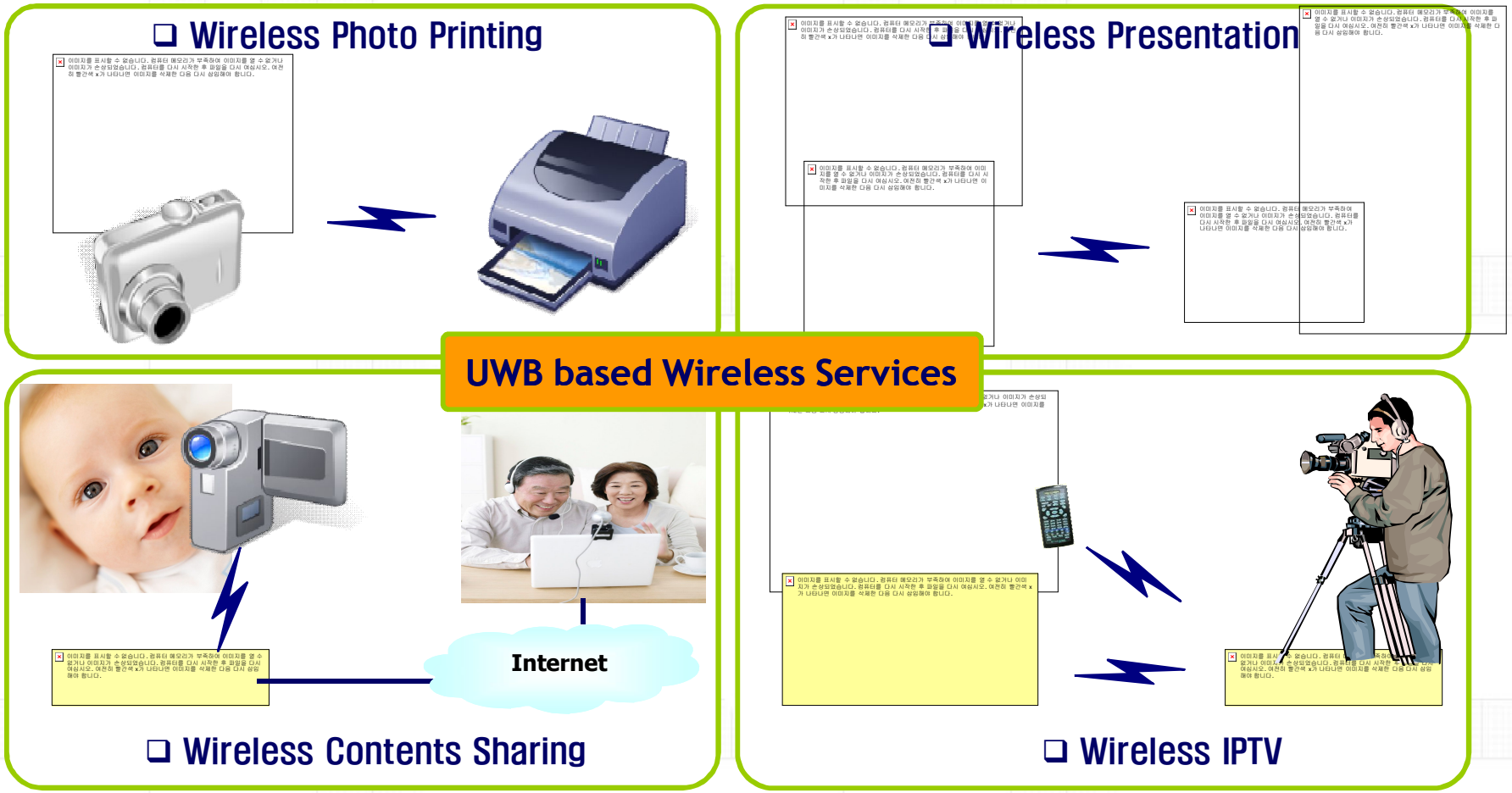




# Wireless Services

- **Useful Service Scenarios**



# CES 2008

WiMedia ALLIANCE

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**FOR IMMEDIATE RELEASE**

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## Ultra-Wideband Products Showcased at CES 2008

***WiMedia UWB TechZone Features Latest Applications of WPAN Technology***

**Who:** WiMedia Alliance and member companies including:

- Alereon
- Artimi, Inc.
- Electronics and Telecommunications Research Institute (ETRI)
- Focus Enhancements
- General Atomics
- Intel Corporation
- Sigma Designs
- Stonestreet One
- Sybase iAnywhere
- Taifatech, Inc.
- TRDA – Taiyo Yuden R&D Center of America
- WiLinx
- WiPro NewLogic
- WiQuest Communications
- Wisair

**When:** 2008 International CES
January 7-10, 2008

**Where:** South Hall 3, Booth #31642
Las Vegas Convention Center
3150 Paradise Road, Las Vegas NV 89109

**What:** The WiMedia™ Alliance is showcasing products incorporating its ISO/IEC standardized Ultra-Wideband (UWB) technology at the 2008 International CES. Products on display will include:

- Belkin Wireless USB Adapter & Hub – Model F5U302
- Current Wireless Camera
- Dell Inspiron Notebook PC
- D-Link Wireless USB Adapter & Hub – Models DUB-1210/DUB-2240
- Lenovo T61/T61p
- Toshiba Portege R400 and Wireless Port Replicator
- WiQuest's Total Solution for Certified Wireless USB
- WiQuest's WiDV® for Wireless Docking ® Solutions

**[ Key Features ]**

- **WiMedia & CWUSB**
  Certified Wireless USB (CWUSB) brings convenience of USB 2.0 WITHOUT any wire !!
  Wireless Adapter (WA) Model defined by CWUSB supports legacy USB 2.0 devices via CWUSB
  Supports various data transfer rates defined by WiMedia UWB
  → 480/400/320/200/160/106/80/53Mbps (max. 480Mbps@3m)
- **Device Wire Adapter (DWA)**
  Connects various USB devices with host PC via CWUSB
  Supports Cable-Based Association (CBA)
  Provides 4 USB 2.0 ports for High/Full-speed USB devices
  → Turns a DWA into a 4-port Wireless USB Hub
  Provides Multi-Memory Card slots
- **WiMedia Logical Link Control Protocol (WLP)**
  Provides IP connections over WiMedia UWB

**[ System Configurations ]**

- CWUSB Host (HWA or WHCI Model) & Multi-port Wireless USB Hub
- Legacy USB (OHCI/EHCI) Device Support
- 4-port USB HUB + Multi Card Reader (CF/MS/XD/SD)

- Concurrent WLP & WUSB service over WiMedia UWB
- Play multimedia data stored in the remote WUSB and WLP devices
- File transfer between WUSB host and WUSB device

# Conclusions

- WiMedia UWB : WPAN 응용
  - Wireless USB
  - WLP
  - DLNA
  - Bluetooth …
- Many Applications
  - HWA
  - DWA : Hub, Docking Station
  - CF or SDIO with WUSB
- Problems !!!
  - Chip Delivery
  - Device Driver Supporting
  - Killer Application?

# Q & A

"PC~주변기기·가전 연결할 때

## 케이블 필요없어요"

ETRI, 무선 USB 플랫폼 개발

앞으로는 PC와 주변기기·가전기기를 서로 연결하는 복잡한 케이블이 사라질 전망이다.

한국전자통신연구원(ETRI·원장 최문기)은 3일 차세대 근거리 초고속 무선통신으로 주목받고 있는 무선 USB 기[illegible]을 적용한 '다기능 무선[illegible]폼·사진'을 개발하[illegible]다고 밝혔다.

이 플랫폼은 인텔[illegible] 무선통신(UWB) 기술[illegible]로 개발됐다. 기존의 유[illegible] 제품을 변형하지 않고 그[illegible] 사용하면서도 무선 USB [illegible]장치(DWA)를 구동하는 SW [illegible]술 및 멀티 카드[illegible]재하고 있다.

3m 이내에서 최대 [illegible]m 이내에서 110Mbps의 속도[illegible]공하며 WPAN 환경에서 초고속 무선 멀티미디어 스트리밍[illegible]스 및 파일 송수신 서비스 등에 적합하다.

이 기술을 활용하면 캠코더나 디지털카메라 등 유선 USB 저장장치의 정보를 PC로 다운로드할 때 USB 케이블을 PC에 직접 연결해야 하는 번거로움 없이 정보를 제공받을 수 있다. 또 무선으로 IP 서비스를 지원, 집안에서 IPTV 시청뿐 아니라 무선 인터넷[illegible]용할 수도 있다.

[illegible] SW·컴퓨팅 부[illegible]단장은 "DWA는 현[illegible]에 출시된 유선 USB 장치를 무선으로 수용하기 위한 것"이라며 "유선기술이 무선기[illegible] 완전히 대체되기 전까지 [illegible]으로 사용할 수 있도록 개발했다"고 말했다.

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